

Economy of Innovation and Technological Change: A Theoretical Approach of Schumpeter

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ABSTRACT

In the current economic dynamics, the leading role of technological innovation in business competitiveness, development and economic growth is widely recognized and accepted. The objective of this article is to focus on the field of economic and business analysis of the process of innovation and technological change, as a socio-economic process, an objective that is developed from a review of the theoretical contributions, which can well be called the father of an economy of innovation of technological change.

KEYWORDS: Innovation, Keynesian model, Technological Change, Schumpeter

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INTRODUCTION

The Keynesian paradigm of macro-economic adjustments that dominated the academic and economic world in the decades following the war considered technological change only as *technical progress*, within its production functions, that is, simply as a trend over time, without achieving in this way to raise in its real dimension the relationship between productivity and technological change. The neoclassical theory of growth, by formally introducing *technical progress* into its analysis (Abramovitz, 1956; Solow, 1957; Solow, 1956.), implicitly incorporates the assumption that *technical progress* can be expressed in terms of an overall rate, in the form of an exogenous factor that appears to be reflected in residual terms.¹

Although some neoclassical economists, in reaching conclusions similar to those of Solow (Denison, 1962), by considering technical progress as a differentiating source of productivity growth and describing it as an irregular diffusion among different industries, fail to explain clearly and to include in their models the relationship of this progress with the rest of the economic variables, technical progress that turned out to be something *unexpected* and *rare* for these economists. This condition led to consider it as an exogenous element to the economic system, on which the economic agents lacked control, exogenousness that is reflected in the growth models, when presenting the technical progress, as a residual element that is not clearly observable nor little explainable.

However, it was not until the economic crisis of the 1970s that the growth of industries based on advances in mi- chro-

electronics, specifically computers and information processing systems, showed growth rates that exceeded the explanatory capacity of neoclassical capital and labour plans. Today innovation plays important role in public transport, smart cities and other business cycles (Temur 2020).

Thus, in the economic analysis, as an explanatory centre of this economic growth, the variables related to technological progress are proposed (Romer, 1990). Education, Research and Experimental Development and Innovation, will then be the central elements in explaining this growth, relegating the role of capital investments to a second level (OECD, 1998; Romer, 1986).

Growth is driven by technological change, which arises from an intentional investment decision made by agents to maximize their utility (Romer, 1990. p, S71.)". This turn to the recognition of the discretion of economic agencies to determine their level of investment in a given endogenous factor; technological innovation (Romer, 1990.) or of human capital accumulation, either through *schooling* or *learning-by-doing* (Lucas, 1988.), allows us to take up again the path of thought that relates technological change and endogenous economic growth.

In this way, a new school of thought, called the *economy of innovation and technological change* or *neo-schumpeterine* economy, which, taking up again the theoretical approaches of J. Schumpeter's theoretical approaches to long-term economic cycles, dynamic analysis, endogenous technical progress, business and innovation, concepts that had been

almost forgotten in economic analysis until then and which, supported by new empirical evidence that closely relates economic development and business competitiveness with technological innovation, opens the doors to numerous lines of research, the aim of which will be to explain and improve the relations between innovation, technological change and economic development.

It is in this context that the present article is developed, which pursues a triple purpose; firstly to take up the contributions of Schumpeter, a visionary of his time, as an obligatory route when embarking on the study and research of the innovation process. Secondly, to draw the attention of members of the academic communities of economics and The company, in terms of the role it should play in the study and research of the innovation process, as an economic process, and not just as an engineering one. And lastly; a little less pretentious than the previous ones, but no less important, which is to refresh experts in the research of the innovation process and to initiate, or why not, to captivate neophytes in the field, with the always valid and revitalizing approaches of Joseph A. Schumpeter.

RESEARCH METHOD AND LITERATURE REVIEW

It would not be possible to address the study of the innovation process today without referring to Joseph A. Schumpeter (1883-1950), is this Austrian economist and sociologist, considered by many as the most important economist of the twentieth century (Swedberg et al., 2001.) who introduces, as a central element of the theoretical body of economic analysis, the process of company innovation. With his enormous contribution to the field of study of the process of innovation and technological change, he transcends the static and short-term thinking that dominated his time, proposing theoretical concepts that even today constitute the fundamental theoretical basis of the analysis and controversy² of the innovation process. In this section a brief synthesis is made of his approaches to the topic of study, which are developed by the author in his three main works on the subject; *Theory of Economic Development* (Schumpeter, 1967), *Capitalism, Socialism and Democracy* (Schumpeter, 1968) and *Business Cycles* (Schumpeter, 1939).

INNOVATION AS A DRIVING FORCE OF CAPITALISM

By moving away from the classical paradigm of static analysis of economic cycles and introducing dynamic analysis from industrial change, Schumpeter is sure: "first, that capitalism must be treated as a process of evolution, and that all its fundamental problems stem from the fact that it is a process of evolution; and second, that this evolution does not consist of the effects of external factors (including political factors) on the capitalist process, nor the effects of slow growth of capital, population, etc.... but in this kind of economic mutation, I dare to use a biological term, which I have given the name of innovation". Innovation plays important role in motivation of workers.

This dynamic analysis receives from Schumpeter the name of *the circular current*, which under the hypothesis of free competition and in adhesion to the model of general balance of Walras, he describes as a current that "feeds on the eternal sources of labour force and the earth, and runs in each economic period to the deposits that we call income, to be transformed there in satisfaction of needs" (Schumpeter, 1967. p, 57). However, Schumpeter is aware that this *circular*

current is altered by unspecified changes other than simple economic growth, which arise over time and whose analysis escapes from the *circular current*. It is in this point of its analysis, where it introduces the term *development*⁴ to refer "to the changes of the economic life that have not been imposed to it from the outside, but that have an internal origin" (Schumpeter, 1967. p, 74), this is, in the center of the industrial activity itself and not in the needs of the consumers, considering the preferences of them as simply *given* and in front of which the producer will not require to pay more attention, since it is "the producer who initiates the economic change, educating even the consumers if it were necessary; he teaches them to need new things or things that differ in some aspect to the already existing ones" (Schumpeter, 1967. p, 76).

This vision, which places producers and consumers in antagonistic positions in the innovation process and abandons the latter as simple receptors of industrial developments, is quite different from current innovation models, which consider customers or markets as one of the main sources of innovation or, at least, of information for the development of innovations⁵.

Schumpeter, then, develops around production, understood as "combining matter and forces" (Schumpeter, 1967. p, 76) its conceptualization on innovation, understanding it as; "to produce other things, or the same ones by different methods" (Schumpeter, 1967. p, 76). Detailing five categories, namely:

- "The introduction of a new good - that is, one with which consumers have not become familiar - or of a new quality, of a good.
- The introduction of a new method of production, that is, one not tested by experience in the manufacturing industry concerned, which does not need to be based on a new scientific discovery, and may simply consist of a new way of handling a commodity commercially.
- The opening of a new market, i.e. a market into which the special branch of manufacturing in the country concerned has not entered, despite the fact that such a market existed previously.
- The conquest of a new source of supply of raw materials or manufactured goods, whether or not it existed previously as in other cases.
- The creation of a new organization of any industry, such as that of a monopoly position or the annulment of an existing monopoly position with anteriority" (Schumpeter, 1967. p, 77).

Three fundamental elements are particularly important for the creation of the previous combinations, in the first place; the new companies, to which Schumpeter attributes the leading role in the creation of innovations over existing companies⁶, which would be destined to be replaced by the new companies or new combinations, as well as the induction of processes of economic grandeur and decline, sufficient to "...Serve as a line of demarcation between two epochs of the social history of capitalism" (Schumpeter, 1967. p, 78).

Secondly, innovations will require the achievement of the necessary means for their production, which would come from the entrepreneur's surpluses or in their absence, and this is the point that Schumpeter highlights as "interesting, as well as the rule -the wealthy must resort to credit,... if he wishes to put into practice a new combination that cannot be financed by his previous income, as happens with the

established ne-gocios" (Schumpeter, 1967. p, 80.). This is then the task of the *capitalist*, who "makes possible the realization of new combinations, and it seems as if he authorizes men in the name of society to realize them. It is the ephor of the economy of change" (Schumpeter, 1967. p, 84.).

The *company* is presented as the third and last element, being for Schumpeter the fundamental element of the economic development. He understands by *enterprise* the "realization of new combinations, and as *entrepreneurs* the individuals in charge of directing such realization" (Schumpeter, 1967. p, 84.). The enterprise and therefore the innovations of localization are thus detached, and the dimension of functionality is attributed to them.

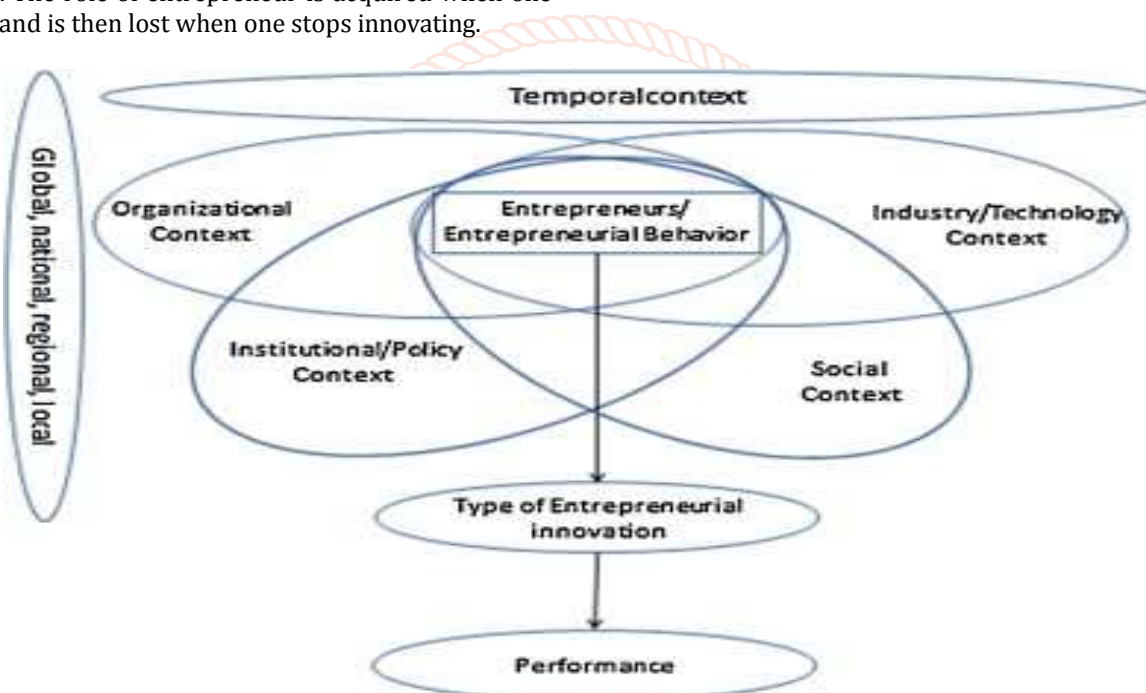
THE ROLE OF INNOVATION AND THE ROLE OF THE ENTREPRENEUR

On the contrary, it is a *function*, with the qualification of *entrepreneur being* achieved by any individual who carries out new combinations, i.e. the function of innovating, without the obligation to belong to a company and losing his or her qualification as an *entrepreneur once he or she* stops innovating. The role of entrepreneur is acquired when one innovates and is then lost when one stops innovating.

Thus, the innovative subject not only acquires the role of entrepreneur, but also *rises socially*, being this the vehicle of continuous replacement of the upper strata of society.

In this way, a differentiation is made between the entrepreneur: the innovator and the capitalist, not considering the shareholders as entrepreneurs in themselves, but as mere capitalists who share in the profits resulting from the process of business innovation, as compensation for their exposure to possible losses, that is, for their exposure to the risk inherent in the innovation process.

In his analysis, he highlights the personal characteristics or conditions of the entrepreneur, especially *leadership* as a "special kind of function" (Schumpeter, 1967. p, 97.), a peculiarity he attributes to him because he considers that the realization of new combinations, that is, innovation, is a *special* process, which for its realization requires a special kind of function. In this way, for the realization of the routine work, it is not required to have the capacity to do it. The leadership of the innovator plays an important role only in activities that are outside the routine.



Picture-1. Entrepreneurial innovation

It also categorizes what would be the motivations of the entrepreneur, i.e. the incentives to innovate:

"The ideal and the will to found a private kingdom, the feeling of power and independence... and the creative joy, of doing things, or simply of exercising energy and ingenuity" (Schumpeter, 1967. p, 102), categories that have not been at all relegated in the current analysis of the innovation process.

INVENTION AND INNOVATION

He introduces the term of *invention*, as a category of analysis different from *innovation*, emphasizing that the same "...are unimportant as long as they are not put into practice" (Schumpeter, 1967. p, 98), he even establishes a relation of non-causality between invention and innovation, this undervaluation of the inventions in Schumpeter leads him to think that for the innovator "it is not part of his function to *create* or *invent* new possibilities, since they are always present, accumulated by all kinds of people" (Schumpeter, 1967. p, 97).

This new category of analysis, and the non-causality of it, as proposed by Schumpeter, will become an inexhaustible source of research and criticism decades later.

Schumpeter warns of the obstacles the entrepreneur will have to overcome;

1. *uncertainty as to the data* used for decision-making,
2. *psychic obstacles* referring to these
3. to individuals' aversion to change and
4. *obstacles of the social environment* against anyone who wants to do something new. It also distinguishes two kinds of risks associated with innovation (Schumpeter, 1967. p, 44.);
5. the risk of technical failure of production and
6. the commercial risk.

From this new presentation of concepts, Schumpeter raises his discontinuous and cyclical vision of the *economic cycle*

within the *circular current*, asking himself if this process of *development* happens in a continuous and uninterrupted way, to which he concludes that "for not distributing equally in time the new combinations, as might be supposed by the general principles of probability - in such a way that intervals of time could be chosen within which a new combination would be put into practice - but that, if they appear, they do so in a discontinuous manner in groups or bands" (Schumpeter, 1967. p, 224.). This concern regarding the dynamics in which innovations appear and the manner in which they are disseminated throughout the industrial fabric, establishes the bases for a future current of thought and analysis around the study of the rate of diffusion and adoption of innovations (Foray et al., 1986.).

Thirty years will pass before Schumpeter, in his work *Capitalism, Socialism and Democracy*, which aims to disseminate his "...thought, observation and research on the problem of socialism¹¹", advances and presents new theoretical conceptualizations about innovation and its analysis of economic cycles, from his renewed conviction of the dynamic analysis of capitalism; "capitalism is, by nature, a form or method of economic transformation and not only is it never stationary, but it can never be" (Schumpeter, 1968. p, 120.), reaffirming itself with new theoretical constructs in what innovation is¹² from the process of *industrial mutation* to which it gave the name of *creative destruction*, "the fundamental impulse that puts and keeps the capitalist machine in motion (Schumpeter, 1968. p, 120.), this process of *creative destruction* constitutes the essential fact of capitalism (Schumpeter, 1968. p, 121

It is placed as scene of the event of this process and as unit of analysis to the company, in which the dynamizing factors of the same one are totally endogenous, in this sense, for Schumpeter, the type of industrial organization plays a leading role and theorizes about the monopoly or the *monopolistic practices* as the most suitable form of industrial arrangement for the proliferation of innovations and its subsequent *creative destruction*; "...these companies are aggressive by nature and handle the weapon of the competition with true effectiveness. Their interference only in the rarest cases can fail to improve the total production in quantity or quality..." (Schumpeter, 1968. p, 127.), recognizes in this type of industrial management a greater degree of technological development that leads to greater innovations, without, of course, ceasing to review in detail the problems of this type of industrial management, in terms of free competition, the efficiency of the economic dynamics and the very future of the capitalist structure which was undermined by this type of business management¹³.

In an apocalyptic vision of the future of capitalism, Schumpeter addresses the reasons why the role of the entrepreneur is coming to an end, "...it is much easier now, than in the past, to perform tasks that are outside the known routine, even though innovation itself is being reduced to routine. Technical progress is increasingly becoming a matter for groups of trained specialists who produce what is required of them and whose methods enable them to foresee practical results from their research. The romanticism of the early commercial adventure is rapidly waning, because many things can now be calculated with complete accuracy that previously had to be glimpsed in a flash of brilliant intuition" (Schumpeter, 1968. p, 182.).

This professionalization of research and development (R&D) activities has brought with it a complexity in business relations, due to the fact that this professionalization is developed in two complementary dimensions, firstly the internal dimension of the company, in which professional R&D activities are developed within the business unit, and a second dimension of analysis, where these R&D activities are developed outside the business unit, by means of contracting them with technological research centres, university institutions or public research bodies, on a national or international level.

CONCLUSION

In this last resignation of cooperation in activities conducive to innovation, the internationalization of R&D activities plays a relevant role in the innovation process, thus opening the way to the study of *international technological cooperation*, understood as; "a process that forms part of the strategy of the company implies the pooling of resources and the transfer of technological knowledge between partners located in different countries".

In this area of discussion, the present work brings together, in a theoretical framework, some of the most significant and general conceptual contributions to the theory of innovation, from *Schumpeter's* economic and social perspective, which can be found in the following chapters.

The following table provides a reference for most of the empirical approaches to the study of the innovation process.

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